

Appl. No. 10/650,505
Amdt. Dated September 8, 2008
Reply to Office Action of July 1, 2008

Attorney Docket No. 81872.0051
Customer No. 26021

REMARKS/ARGUMENTS:

Claims 13, 18, 20, and 34 are amended. Support for the amendments to the claims can be found at p. 19, lines 20, p. 20, line 5 of Applicant's specification. Claims 13-15, 18-20, 23-37, and 39-41 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

The invention relates to a dry etching apparatus, a dry etching method, and a cleaning method adopted in the dry etching apparatus, and more particularly to a dry etching apparatus, a dry etching method, and a cleaning method adopted in the dry etching apparatus suitable for use in texturing the surface of a silicon substrate used in a solar cell or the like. (Applicant's specification, at p. 1, lines 9-14).

INTERVIEW SUMMARY:

On September 3, 2008, Patent Agent Barry Shuman conducted a telephone interview with Examiner Allan W. Olsen. During the interview the parties discussed the Office Action dated July 1, 2008. Specifically, the difference between Katsuhiro and the present invention was discussed. The Examiner appeared to appreciate the Patent Agent's position that in Katsuhiro the plate was in direct contact with the substrate. However, no definitive agreement was reached during the telephone interview.

Applicant would like to thank Examiner Allan W. Olsen for the courtesy of granting a telephone interview with Patent Agent Barry Shuman.

CLAIM REJECTIONS UNDER 35 U.S.C. § 112:

Claims 13-15, 18-20, 23-37, and 39-41 stand rejected under 37 C.F.R. § 112, second paragraph, as being indefinite for failing to particularly point out and

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distinctly claim the subject matter which applicant regards as the invention. The Applicant respectfully traverses this rejection as to the amended claims.

The Office states that the phrase "with a distance" is not attributed to anything specific. In response, Applicant changed "covering said substrate with a plate with a distance" to -- covering said substrate with a plate, wherein said plate is not in direct contact with said substrate--. Withdrawal of this rejection is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 102:

Claims 13, 14, 18, 19, 23-30, 32-36, 39, and 41 stand rejected under 35 U.S.C. 102(b) as being anticipated by Katsuhiro (JP 2000-261008). The Applicant respectfully traverses this rejection. Claim 13, as amended, is as follows:

A method for producing a solar cell comprising:

placing a substrate for a solar cell on an RF electrode provided inside a chamber, directly or through a tray;

covering said substrate with a plate, wherein said plate is not in direct contact with said substrate, wherein said plate comprises an obstacle with a plurality of obstacle forming members that inhibit a part of gas and plasma from passing through said plate; and

forming textures on a surface of said substrate by using residues, wherein said residues chiefly comprise components of said substrate.

Applicant respectfully submits that Katsuhiro cannot anticipate or render claim 13 obvious, because Katsuhiro fails to teach or suggest "covering said substrate with a plate, wherein said plate is not in direct contact with said substrate, wherein said plate comprises an obstacle with a plurality of obstacle forming members that inhibit a part of gas and plasma from passing through said

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plate; and forming textures on a surface of said substrate by using residues, wherein said residues chiefly comprise components of said substrate."

It is an aspect of the present invention that when the silicon substrate is etched with the use of the dry etching apparatus described as above, it is preferable to perform etching while a distance of 5 mm to 30 mm is maintained between the plate 15 and the silicon substrate 1. When arranged in this manner, there can be achieved an effect that the silicon compounds generated during etching are trapped within a space between the silicon substrate 1 and the plate 15, which makes it easier for the residues, chiefly composed of silicon, to be formed on the silicon substrate 1. Hence, not only the formation of the residues, but also the formation of the surface texture 2 can be promoted at the same time. When a distance between the plate 15 and the silicon substrate 1 is less than 5 mm, the opening portions 19 in the plate 15 are transferred as a pattern on the surface of the silicon substrate 1 when the surface texture 2 is formed, thereby leaving unevenness on the surface. Conversely, when a distance exceeds 30 mm, the effect of promoting the formation of the surface texture 2 by generating the residues is reduced. (Applicant's specification, at p. 19, line 20-p. 20, line 12).

Therefore, in the present invention, the plate is not the etching mask but rather the residues. The plate is not in direct contact with the substrate. Therefore, the shape and the position of the texture formed on the substrate do not correspond to the shape and the position of the openings of the plate. The plate is used for controlling the amount of gas (or plasma) and trapping the residues in the space between the plate and the substrate.

In contrast, Katsuhiro's screen is used as an etching mask. Therefore, Katsuhiro's screen is directly on the substrate. (Katsuhiro, Abstract). Consequently, the shape and the position of the texture formed on the substrate correspond to the shape and the position of the openings of the screen.

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The Office at p. 4, lines 6-8 of the Office Action states,

"It would have been obvious to one skilled in the art to optimize the spacing between the Katsuhiro's screen and substrate to maximize the formation of amount of black silicon."

Applicant respectfully disagrees. Katsuhiro at paragraph [0046] teaches that the use of a mask allows for the controlled generation of needlelike black silicon. And this controlled generation produces uniform irregularity and reinforcement with sufficient N+ diffusion layer formed on it. Thus, Katsuhiro is teaching the use of a print mask.

Furthermore, the above desirable results are obtained by sticking a mask screen 15, which has fine openings, over a polycrystal silicon substrate 1 and performing the etching of a surface of the substrate 1 by the mask screen 15 (Katsuhiro, paragraph [0045]).

In summary, Katsuhiro's invention produces the above desirable results by having the screen in direct contact with the substrate. Therefore, Katsuhiro teaches away from the present invention.

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. (MPEP 2141.02).

Therefore, without the benefit of the Applicant's disclosure, there would have been no incentive or reason for one of ordinary skill in the art to want to optimize the spacing between the Katsuhiro's screen and substrate to maximize the formation of amount of black silicon. In order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings. (MPEP 2143).

"Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either

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explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art." (MPEP 2143.01).

In light of the foregoing, Applicant respectfully submits that Katsuhiro cannot anticipate or render claim 13 obvious, because the Katsuhiro fails to teach or suggest each and every claim limitation. Claims 14 and 23-30 depend from claim 13 and cannot be anticipated or rendered obvious for at least the same reasons as claim 13. Claims 18, 32-36, 39, and 41, similarly, require "covering said substrate with a plate, wherein said plate is not in direct contact with said substrate, said plate being provided with a number of opening portions, wherein said plate inhibits a part of gas and plasma from passing through said plate" and "textures are formed on a surface of said substrate by using residues, wherein said residues chiefly comprise components of said substrate." Therefore, claims 18, 32-36, 39, and 41 cannot be anticipated or rendered obvious over Katsuhiro for reasons discussed above. Withdrawal of this rejection is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103:

Claims 15, 31, and 40 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Katsuhiro. Applicant respectfully traverses this rejection.

Claims 15, 31 and 40 depend from claims 13 and 34, respectively, and are therefore, patentable over Katsuhiro for at least the same reasons discussed above. Withdrawal of this rejection is thus respectfully requested.

ALLOWABLE SUBJECT MATTER:

The Office states, "Claim 20 (and dependent claim 19) would be allowable if rewritten or amended to overcome the rejection under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action." In response, the Applicant amended claim 20 to overcome the rejections under 35 U.S.C. 112, second paragraph.

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Withdrawal of this objection and allowance of claims 19 and 20 is thus respectfully requested.

Applicant believes the foregoing amendments comply with requirements of form and thus may be admitted under 37 C.F.R. § 1.116(b). Alternatively, if these amendments are deemed to touch the merits, admission is requested under 37 C.F.R. § 1.116(c). In this connection, these amendments were not earlier presented because they are in response to the matters pointed out for the first time in the Final Office Action.

Lastly, admission is requested under 37 C.F.R. § 1.116(b) as presenting rejected claims in better form for consideration on appeal.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (310) 785-4600 to discuss the steps necessary for placing the application in condition for allowance.

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If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
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